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(54) Method and apparatus for transmission power control of a mobile station during soft handoff in a CDMA system.

(57) A transmission power control method in CDMA, which is capable of increasing the capacity in terms of the number of subscribes by reducing transmission power by achieving highly accurate transmission power control during a soft handoff. A mobile station determines its transmission power during the soft handoff by comparing a transmission power control bit from the old base station with that from a new base station, and by selecting the transmission power control bit that indicates lower transmission power of the mobile station. In addition, the mobile station determines the transmission power control bit for the base stations by comparing the received SIR from the old base station with that from the new base station, and by selecting the greater received SIR. This make it possible to reduce the transmission power, and increase the capacity in terms of the number of subscribers.

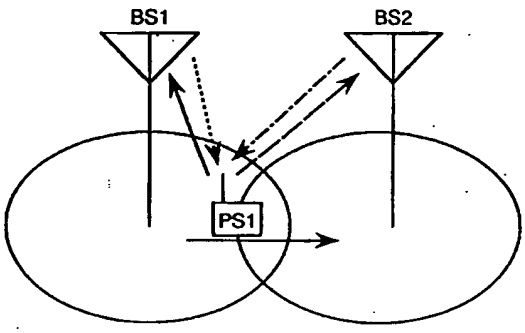

FIG. 1

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The present invention relates to a transmission power control method for radio communications using a CDMA (Code Division Multiple Access) system, and a mobile station using this method.

In CDMA systems, transmission power control is an essential technique. This is because SIRs (Signal-to-Noise Ratios) of signals which are transmitted from mobile stations and received by a base station within a cell must be kept equal to each other at the base station to prevent the reduction in the capacity in terms of the number of subscribers. In addition, SIRs of signals which are transmitted from the base station and received by the mobile stations must be made equal.

CDMA systems can use a characteristic channel transfer method called soft handoff. The soft handoff is characterized by commencing communications with a new base station before terminating communications with the old base station. Specifically, a mobile station transmits a signal simultaneously to the old base station and a new base station in the same code and at the same frequency, in different codes and at the same frequency, in the same code and at different frequencies, or in different codes and at different frequencies, and transfers communications from the old base station to the new base station in accordance with received power of signals independently received from the two base stations. Therefore, the soft handoff is an effective method for reducing transmission power of the mobile stations and base stations.

Fig. 1 schematically illustrates a soft handoff. In Fig. 1, the reference character BS1 designates an old base station, BS2 designates a new base station, and PS1 denotes a mobile station that transmits a signal or signals to the two base stations BS1 and BS2. In this case, the mobile station transmits one wave when the same code and the same frequency are used, and two waves when different codes and different frequencies are used. On the other hand, the base stations BS1 and BS2 transmit independent signals of the same content to the mobile station PS1. In this figure, the mobile station PS1 is transferring its communications with the old base station BS1 to communications with the new base station BS2.

Fig. 2 shows a conventional transmission power control method during a soft handoff. When the mobile station PS1 in the cell linked to the base station BS1 is moving as shown in Fig. 1, it starts a soft handoff from the old base station BS1 to the new base station BS2. More specifically, the mobile station PS1 detects the reduction in the received power in the perch channel from the old base station BS1, and starts the soft handoff to a new base station having a perch channel which provides the mobile station PS1 with highest received power among neighboring cells. Here, a perch channel refers to a channel used when a mobile station selects a new base station. Each base station transmits through its perch channel. The mobile station measures received powers sent through the perch channels of respective base stations, and begins to change the connection to the base station which provides the mobile station with the maximum received power. Thus, the mobile station selects the new base station that provides the maximum received power. During the soft handoff, the transmission power control is performed by open loop control. Fig. 2 illustrates this. The mobile station PS1 measures received power levels from the base stations BS1 and BS2 at step S1, and controls its transmission power levels to the base stations BS1 and BS2 independently at step S2 on the basis of the received power levels. On the other hand, the base stations BS1 and BS2 measure received power levels from the mobile station at steps S3 and S4, respectively, and control their transmission power levels to the mobile station PS1 at steps S5 and S6 independently.

Thus, the open loop transmission power control is used in the conventional soft handoff. As a result, highly accurate transmission power control cannot be achieved in the case where there is little correlation between a forward (from base station to mobile station) channel and a reverse (from mobile station to base station) channel. This presents a problem in that the capacity in terms of the number of subscribers is reduced.

Therefore, an object of the present invention is to provide a transmission power control method in a CDMA system, and a mobile station using the same, which can increase the capacity in terms of the number of subscribers by implementing highly accurate, power reduced transmission power control.

In a first aspect of the present invention, there is provided a transmission power control method during a soft handoff which transfers communications between a mobile station and an old base station to communications between the mobile station and a new base station in a CDMA (Code Division Multiple Access) system, the transmission power control method comprising the steps of:

extracting, at the mobile station, a first transmission power control bit which designates transmission power of the mobile station, from a received signal transmitted from the old base station;

extracting, at the mobile station, a second transmission power control bit which designates transmission power of the mobile station, from a received signal transmitted from the new base station;

comparing, at the mobile station, the transmission power designated by the first transmission power control bit and the transmission power designated by the second transmission power control bit;

selecting, at the mobile station, one of the first transmission power control bit and the second transmission power control bit, a selected transmission

power control bit designating lower transmission power; and

controlling, at the mobile station, the transmission power of the mobile station in accordance with the selected transmission power control bit.

Here, the mobile station may perform the soft handoff with the old base station and the new base station by using one of the combinations of an identical spreading code and an identical transmission frequency, different spreading codes and an identical transmission frequency, an identical spreading code and different transmission frequencies, and different spreading codes and different transmission frequencies.

In a second aspect of the present invention, there is provided a transmission power control method during a soft handoff which transfers communications between a mobile station and an old base station to communications between the mobile station and a new base station in a CDMA (Code Division Multiple Access) system, the transmission power control method comprising the steps of:

measuring, at the mobile station, a first SIR (Signal-to-Interference Ratio) of a received signal from the old base station to interference;

measuring, at the mobile station, a second SIR of a received signal from the new base station to the interference;

comparing, at the mobile station, the first SIR with the second SIR;

selecting, at the mobile station, one of the first SIR and the second SIR, a selected SIR being greater than the other;

deciding, at the mobile station, in accordance with the selected SIR, a transmission power control bit for determining transmission power of the old base station and the new base station; and

transmitting the transmission power control bit from the mobile station to the old base station and the new base station.

The transmission power control method may further comprise the steps of:

measuring, at the mobile station, a first SIR (Signal-to-Interference Ratio) of the received signal from the old base station to interference;

measuring, at the mobile station, a second SIR of the received signal from the new base station to the interference;

comparing, at the mobile station, the first SIR with the second SIR;

selecting, at the mobile station, one of the first SIR and the second SIR, a selected SIR being greater than the other;

deciding, at the mobile station, in accordance with the selected SIR, a third transmission power control bit for determining transmission power of the old base station and the new base station; and

transmitting the third transmission power control bit from the mobile station to the old base station and the new base station at transmission power controlled in accordance with the selected transmission power control bit.

In a third aspect of the present invention, there is provided a mobile station performing transmission power control during a soft handoff which transfers communications between a mobile station and an old base station to communications between the mobile station and a new base station in a CDMA (Code Division Multiple Access) system, the mobile station comprising:

means for extracting a first transmission power control bit which designates transmission power of the mobile station, from a received signal transmitted from the old base station;

means for extracting a second transmission power control bit which designates transmission power of the mobile station, from a received signal transmitted from the new base station;

means for comparing the transmission power designated by the first transmission power control bit and the transmission power designated by the second transmission power control bit;

means for selecting one of the first transmission power control bit and the second transmission power control bit, a selected transmission power control bit designating lower transmission power; and

means for controlling the transmission power of the mobile station in accordance with the selected transmission power control bit.

In a fourth aspect of the present invention, there is provided a mobile station performing transmission power control during a soft handoff which transfers communications between a mobile station and an old base station to communications between the mobile station and a new base station in a CDMA (Code Division Multiple Access) system, the mobile station comprising:

means for measuring a first SIR (Signal-to-Interference Ratio) of a received signal from the old base station to interference;

means for measuring a second SIR of a received signal from the new base station to the interference;

means for comparing the first SIR with the second SIR;

means for selecting one of the first SIR and the second SIR, a selected SIR being greater than the other;

means for deciding, in accordance with the selected SIR, a transmission power control bit for determining transmission power of the old base station and the new base station; and

transmitting the transmission power control bit from the mobile station to the old base station and the new base station.

The mobile station may further comprise:

means for measuring a first SIR (Signal-to-Interference Ratio) of the received signal from the old base station to interference;

means for measuring a second SIR of the received signal from the new base station to the interference;

means for comparing the first SIR with the second SIR;

means for selecting one of the first SIR and the second SIR, a selected SIR being greater than the other;

means for deciding, in accordance with the selected SIR, a third transmission power control bit for determining transmission power of the old base station and the new base station; and

means for transmitting the third transmission power control bit from the mobile station to the old base station and the new base station at transmission power controlled in accordance with the selected transmission power control bit.

According to the present invention, the mobile station determines its transmission power during the soft handoff by comparing a transmission power control bit from the old base station with that from the new base station, and by selecting the transmission power control bit that indicates lower transmission power of the mobile station. Alternatively or in addition, the mobile station determines during the soft handoff the transmission power control bit for the base stations by comparing the received SIR from the old base station with that from the new base station, and by selecting the greater received SIR. This make it possible to reduce the transmission power of the base stations, and increase the capacity in terms of the number of subscribers.

The above and other objects, effects, features and advantages of the present invention will become more apparent from the following description of the embodiment thereof taken in conjunction with the accompanying drawings.

Fig. 1 is a schematic diagram illustrating a common soft handoff;

Fig. 2 is a diagram illustrating a conventional transmission power control method;

Fig. 3 is a diagram illustrating a first transmission power control method in accordance with the present invention;

Fig. 4 is a diagram illustrating a second transmission power control method in accordance with the present invention;

Fig. 5 is a diagram illustrating a third transmission power control method in accordance with the present invention; and

Figs. 6A and 6B are block diagrams showing an embodiment of a mobile station, to which the third transmission power control method in accordance with the present invention is applied.

The invention will now be described with reference to the accompanying drawings.

Fig. 3 illustrates a first method in accordance with the present invention. When the mobile station PS1 is carrying out a soft handoff with respect to the base stations BS1 and BS2, the mobile station determines its transmission power level to the base stations BS1 and BS2 in accordance with the transmission power control bits transmitted from these base stations BS1 and BS2, thereby performing a closed loop transmission power control.

More specifically, the mobile station compares the transmission power control bit from the base stations BS1 with that from the base station BS2 at step S11. Since the transmission power control bit from the base station BS1 and that from the base station BS2 are independent of each other, the values of the bits may differ from each other. In such a case, the mobile station PS1 determines its transmission power in accordance with the transmission power control bit that indicates lower transmission power to the mobile station PS1 at step S12.

Thus, according to the present invention, when the mobile station PS1 is moving from the old base station BS1 to the new base station BS2, the transmission power control of the mobile station is performed in accordance with the transmission power control bit transmitted from the base station having greater received SIR than the other base station. As a result, the received SIR at the old base station BS1 is rapidly reduced, and the channel between the old base station BS1 and the mobile station is disconnected. This makes it possible to complete the soft handoff in a short time, and to reduce the transmission power, as well. Reduction in the transmission power of the mobile station PS1 thus achieved makes it possible to reduce the interference to other cells, and hence, to increase the capacity in terms of the number of subscribers.

Fig. 4 illustrates a second method in accordance with the present invention. When the mobile station PS1 is carrying out a soft handoff with respect to the base stations BS1 and BS2, the base stations BS1 and BS2 determine their own transmission power levels to the mobile station PS1 in accordance with the transmission power control bit for the base stations which is transmitted from the mobile station, thereby performing a closed loop transmission power control as in the case of Fig. 3.

Next, a method in which the mobile station PS1 determines the transmission power control bit for the base stations will be described. The transmission power control bit is used to determined the transmission power of the base stations BS1 and BS2. Since the base stations BS1 and BS2 transmit independent waves to the mobile station PS1, the received SIRs at the mobile station will differ from each other. Taking account of this, the transmission power control bit for the base stations is determined as shown in Fig.

4.

In Fig. 4, the mobile station PS1 measures the received SIR from the old base station BS1 and that from the new base station BS2 at step S21. Subsequently, the mobile station PS1 compares the two SIRs at step S22, and determines the transmission power control bit for the base stations in accordance with the SIR having a greater value at step S23.

Thus, according to the present invention, when the mobile station PS1 is moving from the old base station BS1 to the new base station BS2, the mobile station PS1 determines the transmission power control bit for the base station on the basis of the greater received SIR at the mobile station. As a result, the received SIR from the old base station BS1 is rapidly reduced, and the channel between the old base station BS1 and the mobile station PS1 is disconnected. This makes it possible to complete the soft handoff in a short time, and to reduce the transmission power, as well. Reduction in the transmission power of the base stations thus achieved makes it possible to prevent the base stations from becoming interference sources to other cells, and hence, to increase the capacity in terms of the number of subscribers.

Fig. 5 illustrates a third method in accordance with the present invention, which is normally employed in actual transmission power control. In Fig. 5, the transmission power of the mobile station PS1 is determined at steps S11 and S12 as in Fig. 3, and the transmission power control bit for the base stations, which is used to determine the transmission power of the base stations BS1 and BS2, is determined at steps S21 - S23 as in Fig. 4.

Figs. 6A and 6B are block diagrams showing an embodiment of the mobile station PS1 in accordance with the present invention. In Figs. 6A and 6B, the reference numeral 10 designates an antenna, the reference numeral 11 designates a diplexer, the reference numeral 12 designates an RF receiver, the reference numerals 13 and 13' designate despreaders, the reference numerals 14 and 14' designate demodulators, the reference numeral 15 designates a transmission power control (TPC) bit extractor, the reference numeral 16 designates a transmission power control bit selector, the reference numeral 17 designates a transmission power controller, the reference numerals 18 and 18' designate desired wave received power detectors provided in the despreaders 13 and 13', the reference numerals 19 and 19' designate interference wave received power detectors provided in the despreaders 13 and 13', the reference numerals 20 and 20' designate SIR calculators, the reference numeral 21 designates an SIR selector, the reference numeral 22 designates a transmission power control bit decision portion, the reference numeral 23 designates a signal generator, the reference numeral 24 designates a modulator, the reference numeral 25 designates a spreader, and the reference numeral 26 designates an RF transmitter.

Next, the operation of the mobile station will be described referring to Figs. 6A and 6B. A spread-spectrum signals transmitted from the base stations BS1 and BS2 are received by the antenna 10. The received signals are inputted to the RF receiver 12 via the diplexer 11.

In the RF receiver 12, the received signals are passed through a bandpass filter (BPF) to remove components outside the pass band, and are amplified by an amplifier. The amplified signal is down-converted to an intermediate frequency (IF) signal by a signal generated by a local oscillator. The IF signal is passed through a bandpass filter, and its levels is corrected to an appropriate signal level by an automatic gain control circuit (AGC). The output of the AGC undergoes a quasi-coherent detection, and is frequency-converted into a baseband signal. The baseband signal is passed though a lowpass filter (LPF), undergoes an analog-to-digital (A/D) conversion, and is outputted as a digital signal.

The digital signal outputted from the RF receiver 12 is despread by the despreaders 13 and 13', and are outputted as narrow band modulated signals similar to those generated at the base stations BS1 and BS2. The modulated signals are demodulated by the demodulators 14 and 14'.

The outputs of the demodulators 14 and 14' are supplied to the transmission power control bit extractor 15 which extracts from the demodulated signals the transmission power control bits transmitted from the base stations BS1 and BS2. The extracted transmission power control bits are compared by the TPC selector 16, and the TPC bit that indicates smaller transmission power of the mobile station is selected when the two TPC bits differ. The selected TPC bit is supplied to the transmission power controller 17, which determines the transmission power of the mobile station on the basis of the selected transmission power control bit, and provides the RF transmitter 26 with the transmission power control information.

On the other hand, the desired wave received power detectors 18 and 18' and the interference wave received power detectors 19 and 19' in the despreaders 13 and 13' detect the desired wave received powers from the base stations BS1 and BS2, and the interference wave received powers to the desired received waves from the base stations, respectively. On the basis of the detected desired wave received powers and the interference wave received powers, the SIR calculators 20 and 20' obtain the received SIRs of the signals transmitted from the base stations BS1 and BS2, respectively. The SIR selector 21 compares the two received SIRs, and selects the received SIR whose value is greater than the other.

The transmission power control bit decision portion 22 compares the selected received SIR with a predetermined reference SIR, and produces a trans-

mission power control bit which commands an increase in the transmission power of the base stations when the received SIR is less than the reference SIR, or produces a transmission power control bit which commands a decrease in the transmission power when the received SIR is greater than the reference SIR, and supplies the transmission power control bit to the signal generator 23.

The signal generator 23 forms a frame to be transmitted, which includes the transmission power control bit supplied from the transmission power control bit decision portion 22, and provides it to the modulator 24 as a transmitted signal. The transmitted signal is modulated by the modulator 24, spread by the spreader 25, and is supplied to the RF transmitter 26. The transmitted signal which is frequency converted to an IF and then to an RF band by the RF transmitter 26 is transmitted at the transmission power based on the control information outputted from the transmission power controller 16.

The present invention has been described in detail with respect to an embodiment, and it will now be apparent from the foregoing to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects, and it is the intention, therefore, in the appended claims to cover all such changes and modifications as fall within the true spirit of the invention.

Claims

1. A transmission power control method during a soft handoff which transfers communications between a mobile station and an old base station to communications between the mobile station and a new base station in a CDMA (Code Division Multiple Access) system, said transmission power control method characterized by comprising the steps of:

   extracting, at said mobile station, a first transmission power control bit which designates transmission power of the mobile station, from a received signal transmitted from said old base station;

   extracting, at said mobile station, a second transmission power control bit which designates transmission power of the mobile station, from a received signal transmitted from said new base station;

   comparing, at said mobile station, the transmission power designated by said first transmission power control bit and the transmission power designated by said second transmission power control bit;

   selecting, at said mobile station, one of said first transmission power control bit and said second transmission power control bit, a selected transmission power control bit designating lower transmission power; and

   controlling, at said mobile station, the transmission power of said mobile station in accordance with said selected transmission power control bit.

2. The transmission power control method as claimed in claim 1, characterized in that said mobile station performs said soft handoff with said old base station and said new base station by using one of the combinations of an identical spreading code and an identical transmission frequency, different spreading codes and an identical transmission frequency, an identical spreading code and different transmission frequencies, and different spreading codes and different transmission frequencies.

3. A transmission power control method during a soft handoff which transfers communications between a mobile station and an old base station to communications between the mobile station and a new base station in a CDMA (Code Division Multiple Access) system, said transmission power control method characterized by comprising the steps of:

   measuring, at said mobile station, a first SIR (Signal-to-Interference Ratio) of a received signal from said old base station to interference;

   measuring, at said mobile station, a second SIR of a received signal from said new base station to the interference;

   comparing, at said mobile station, the first SIR with the second SIR;

   selecting, at said mobile station, one of said first SIR and said second SIR, a selected SIR being greater than the other;

   deciding, at said mobile station, in accordance with the selected SIR, a transmission power control bit for determining transmission power of said old base station and said new base station; and

   transmitting said transmission power control bit from said mobile station to said old base station and said new base station.

4. The transmission power control method as claimed in claim 3, characterized in that said mobile station performs said soft handoff with said old base station and said new base station by using one of the combinations of an identical spreading code and an identical transmission frequency, different spreading codes and an identical transmission frequency, an identical spreading code and different transmission frequencies, and different spreading codes and different transmission frequencies.

5. The transmission power control method as claimed in claim 1, characterized by further comprising the steps of:

measuring, at said mobile station, a first SIR (Signal-to-Interference Ratio) of the received signal from said old base station to interference;

measuring, at said mobile station, a second SIR of the received signal from said new base station to the interference;

comparing, at said mobile station, the first SIR with the second SIR;

selecting, at said mobile station, one of said first SIR and said second SIR, a selected SIR being greater than the other;

deciding, at said mobile station, in accordance with the selected SIR, a third transmission power control bit for determining transmission power of said old base station and said new base station; and

transmitting said third transmission power control bit from said mobile station to said old base station and said new base station at transmission power controlled in accordance with said selected transmission power control bit.

6. The transmission power control method as claimed in claim 5, characterized in that said mobile station performs said soft handoff with said old base station and said new base station by using one of the combinations of an identical spreading code and an identical transmission frequency, different spreading codes and an identical transmission frequency, an identical spreading code and different transmission frequencies, and different spreading codes and different transmission frequencies.

7. A mobile station performing transmission power control during a soft handoff which transfers communications between a mobile station and an old base station to communications between the mobile station and a new base station in a CDMA (Code Division Multiple Access) system, said mobile station characterized by comprising:

means for extracting a first transmission power control bit which designates transmission power of the mobile station, from a received signal transmitted from said old base station;

means for extracting a second transmission power control bit which designates transmission power of the mobile station, from a received signal transmitted from said new base station;

means for comparing the transmission power designated by said first transmission power control bit and the transmission power designated by said second transmission power control bit;

means for selecting one of said first transmission power control bit and said second transmission power control bit, a selected transmission power control bit designating lower transmission power; and

means for controlling the transmission power of said mobile station in accordance with said selected transmission power control bit.

8. The mobile station as claimed in claim 7, characterized in that said mobile station performs said soft handoff with said old base station and said new base station by using one of the combinations of an identical spreading code and an identical transmission frequency, different spreading codes and an identical transmission frequency, an identical spreading code and different transmission frequencies, and different spreading codes and different transmission frequencies.

9. A mobile station performing transmission power control during a soft handoff which transfers communications between a mobile station and an old base station to communications between the mobile station and a new base station in a CDMA (Code Division Multiple Access) system, said mobile station characterized by comprising:

means for measuring a first SIR (Signal-to-Interference Ratio) of a received signal from said old base station to interference;

means for measuring a second SIR of a received signal from said new base station to the interference;

means for comparing the first SIR with the second SIR;

means for selecting one of said first SIR and said second SIR, a selected SIR being greater than the other;

means for deciding, in accordance with the selected SIR, a transmission power control bit for determining transmission power of said old base station and said new base station; and

transmitting said transmission power control bit from said mobile station to said old base station and said new base station.

10. The mobile station as claimed in claim 9, characterized in that said mobile station performs said soft handoff with said old base station and said new base station by using one of the combinations of an identical spreading code and an identical transmission frequency, different spreading codes and an identical transmission frequency, an identical spreading code and different transmission frequencies, and different spreading codes and different transmission frequencies.

11. The mobile station as claimed in claim 7, further characterized by comprising:

means for measuring a first SIR (Signal-to-Interference Ratio) of the received signal from said old base station to interference;

means for measuring a second SIR of the received signal from said new base station to the interference;

means for comparing the first SIR with the second SIR;

means for selecting one of said first SIR and said second SIR, a selected SIR being greater than the other;

means for deciding, in accordance with the selected SIR, a third transmission power control bit for determining transmission power of said old base station and said new base station; and

means for transmitting said third transmission power control bit from said mobile station to said old base station and said new base station at transmission power controlled in accordance with said selected transmission power control bit.

12. The mobile station as claimed in claim 11, characterized in that said mobile station performs said soft handoff with said old base station and said new base station by using one of the combinations of an identical spreading code and an identical transmission frequency, different spreading codes and an identical transmission frequency, an identical spreading code and different transmission frequencies, and different spreading codes and different transmission frequencies.

13. A transmission power control method for implementation by one mobile station communicating with multiple base stations, wherein during a hand-over period, in which the mobile station communicates with two base stations, the mobile station implements a closed loop transmission power level control.

14. A transmission power control method according to claim 13 wherein said closed loop control is implemented by reference to indicated power levels and/or signal to noise ratios of signals received from the two base stations, selecting the lower of the indicated transmission power levels and/or the greater of the received signal to noise ratios.

15. A method according to claim 13 or 14 wherein each signal received from a base station contains a transmission power control bit for extraction at the mobile station.

16. A method or apparatus having the features of any combination of the preceding claims.

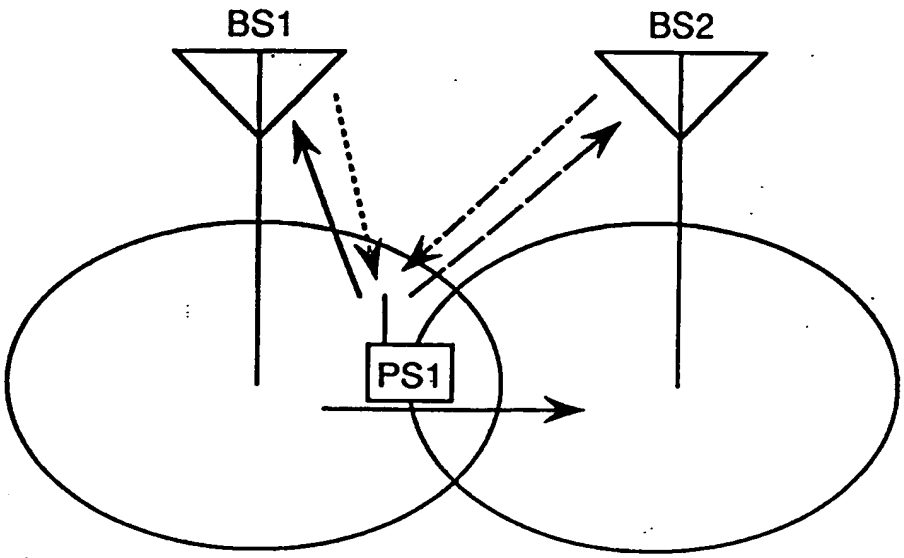

FIG. 1

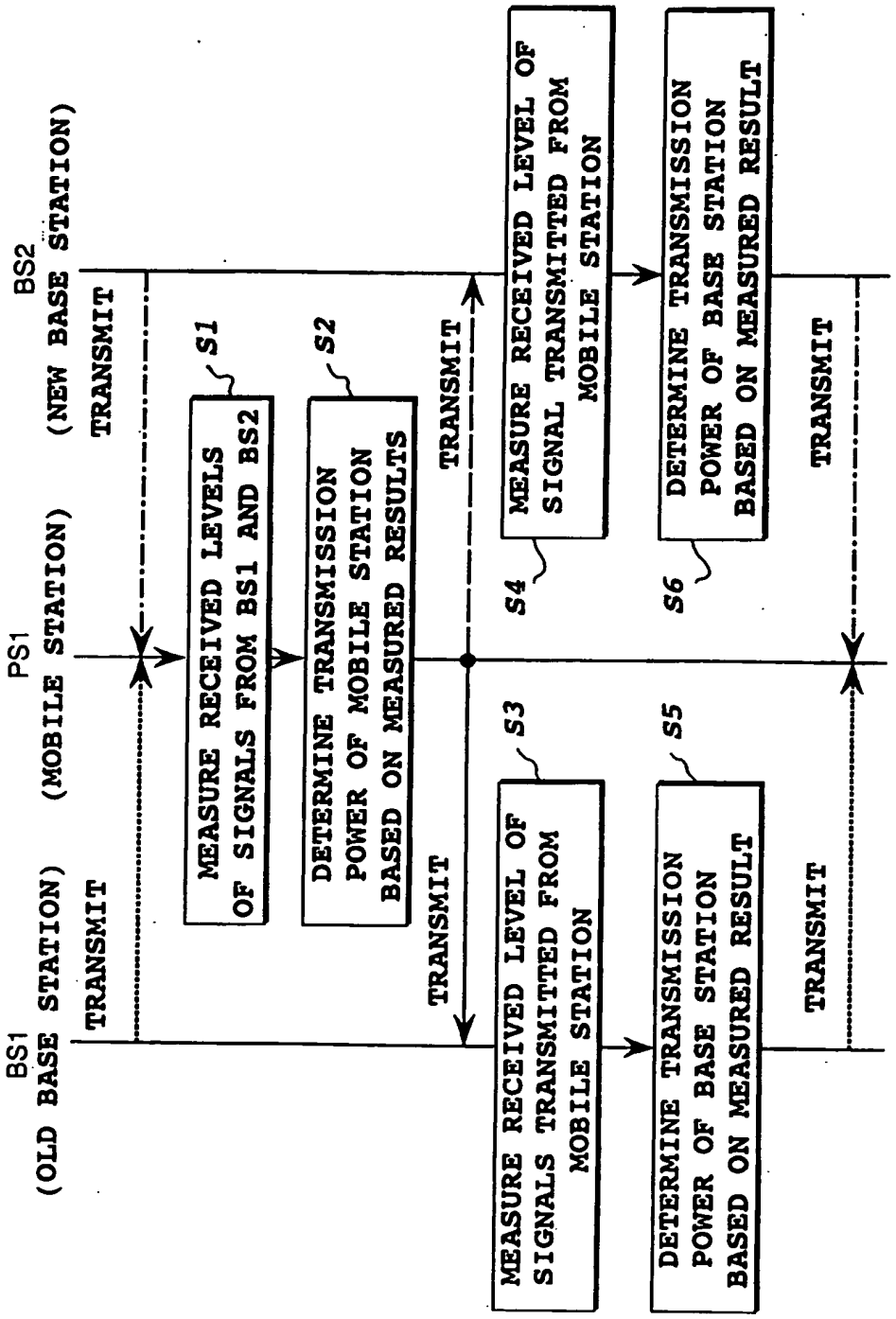

FIG.2
(PRIOR ART)

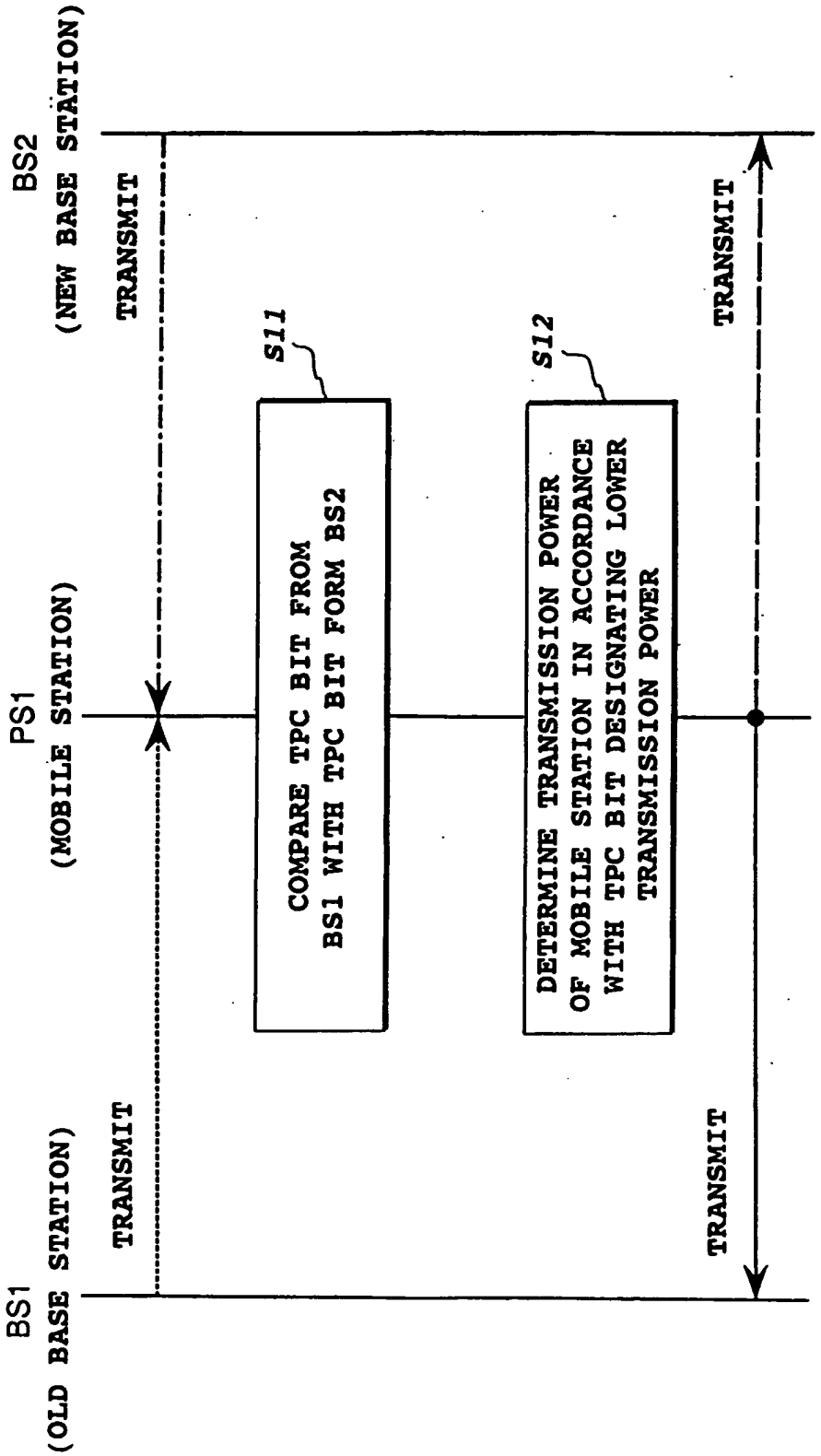
BS2
(NEW BASE STATION)
TRANSMIT
S11
COMPARE TPC BIT FROM
BS1 WITH TPC BIT FORM BS2
S12
DETERMINE TRANSMISSION POWER
OF MOBILE STATION IN ACCORDANCE
WITH TPC BIT DESIGNATING LOWER
TRANSMISSION POWER
TRANSMIT
PS1
(MOBILE STATION)
BS1
(OLD BASE STATION)
TRANSMIT
TRANSMIT

FIG.3

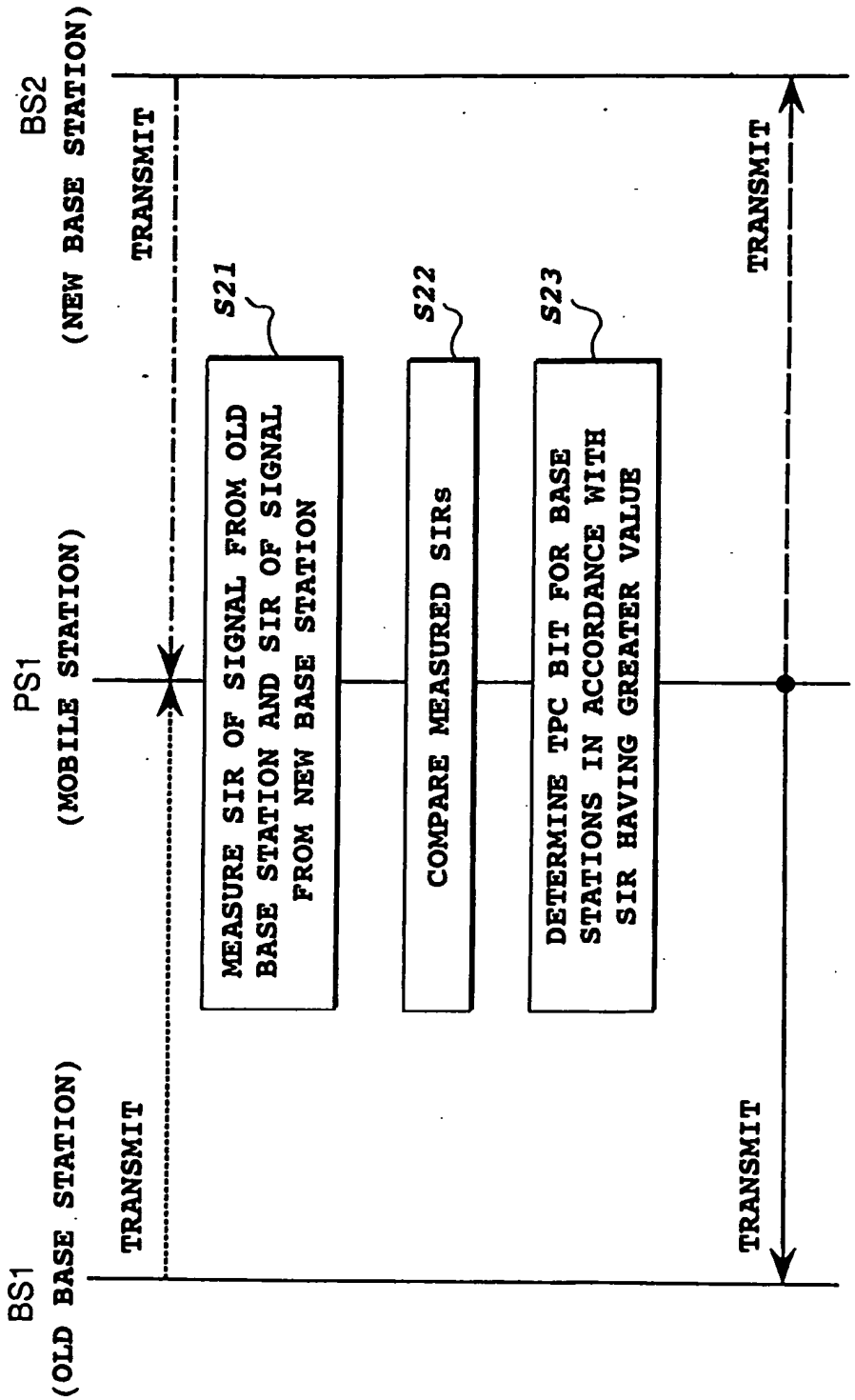
BS1
(OLD BASE STATION)
PS1
(MOBILE STATION)
BS2
(NEW BASE STATION)
TRANSMIT
TRANSMIT
S21
MEASURE SIR OF SIGNAL FROM OLD BASE STATION AND SIR OF SIGNAL FROM NEW BASE STATION
S22
COMPARE MEASURED SIRs
S23
DETERMINE TPC BIT FOR BASE STATIONS IN ACCORDANCE WITH SIR HAVING GREATER VALUE
TRANSMIT
TRANSMIT

FIG.4

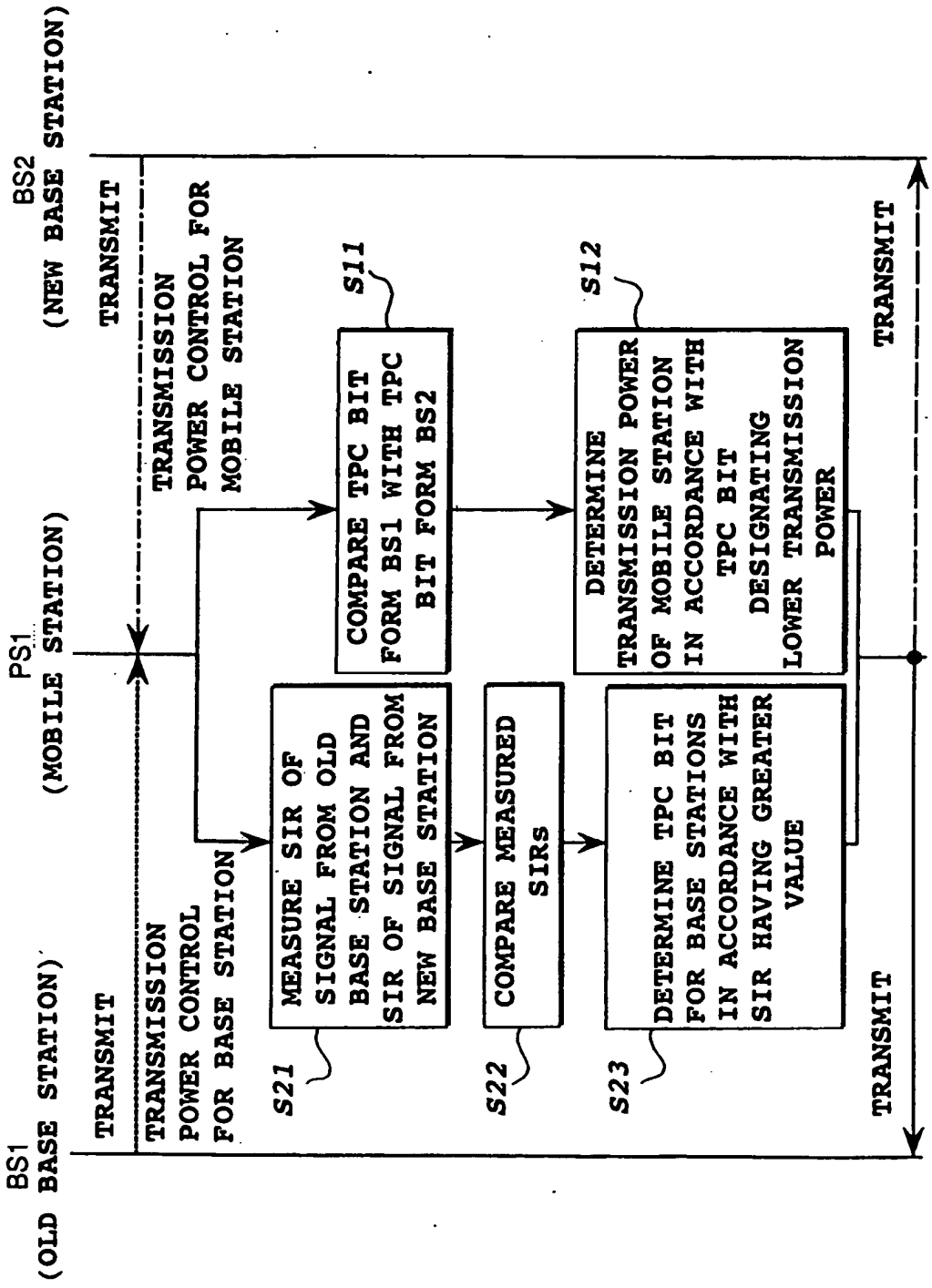
BS1
(OLD BASE STATION)
PS1
(MOBILE STATION)
BS2
(NEW BASE STATION)
TRANSMIT
TRANSMISSION POWER CONTROL FOR BASE STATION
TRANSMISSION POWER CONTROL FOR MOBILE STATION
TRANSMIT
S21
MEASURE SIR OF SIGNAL FROM OLD BASE STATION AND SIR OF SIGNAL FROM NEW BASE STATION
S11
COMPARE TPC BIT FORM BS1 WITH TPC BIT FORM BS2
S22
COMPARE MEASURED SIRs
S23
DETERMINE TPC BIT FOR BASE STATIONS IN ACCORDANCE WITH SIR HAVING GREATER VALUE
S12
DETERMINE TRANSMISSION POWER OF MOBILE STATION IN ACCORDANCE WITH TPC BIT DESIGNATING LOWER TRANSMISSION POWER
TRANSMIT
TRANSMIT

FIG.5

FIG.6

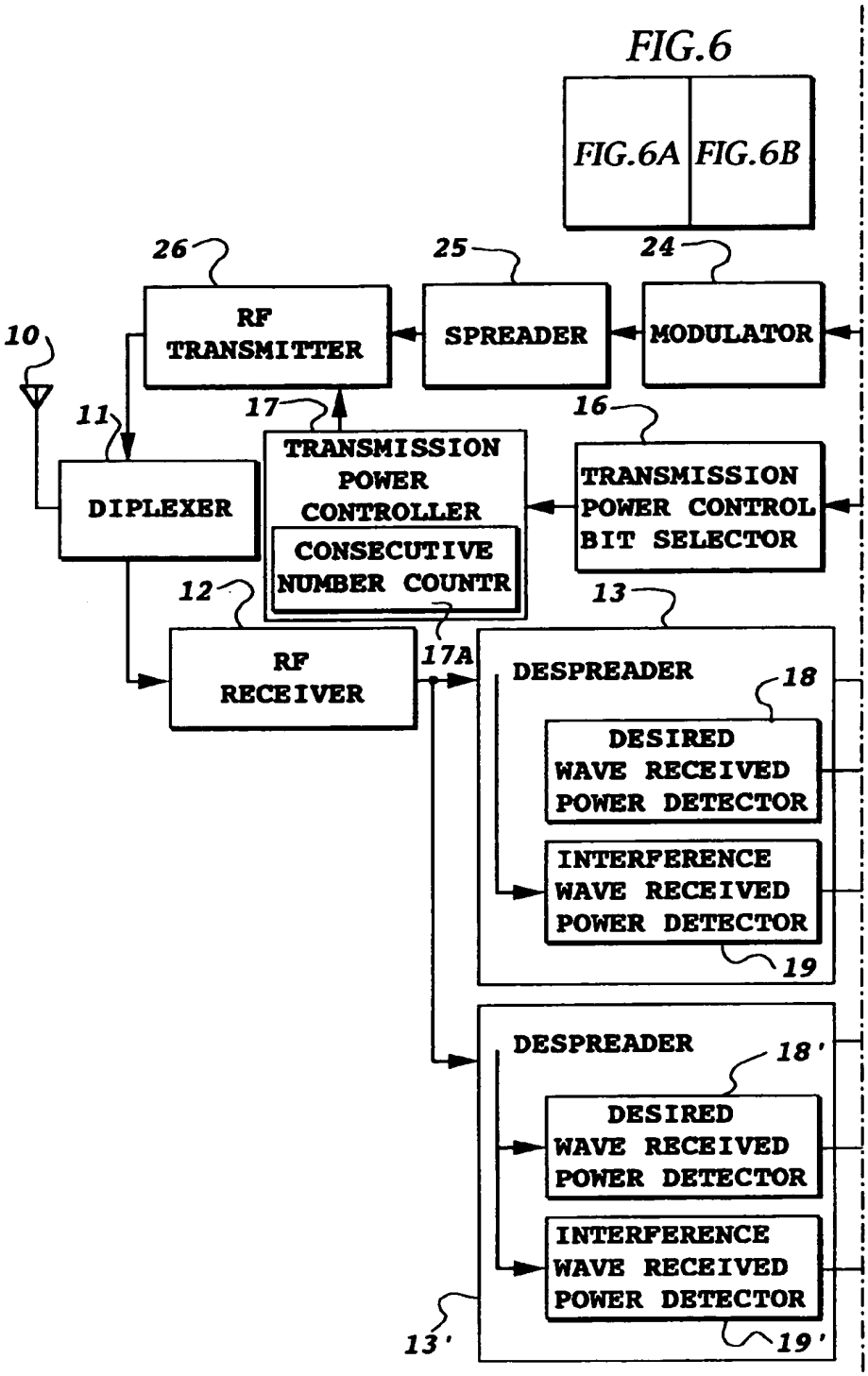
FIG.6A
FIG.6B
26
25
24
RF TRANSMITTER
SPREADER
MODULATOR
10
11
17
16
TRANSMISSION POWER CONTROLLER
CONSECUTIVE NUMBER COUNTR
TRANSMISSION POWER CONTROL BIT SELECTOR
DIPLEXER
12
13
RF RECEIVER
17A
DESPREADER
18
DESIRED WAVE RECEIVED POWER DETECTOR
INTERFERENCE WAVE RECEIVED POWER DETECTOR
19
DESPREADER
18'
DESIRED WAVE RECEIVED POWER DETECTOR
INTERFERENCE WAVE RECEIVED POWER DETECTOR
13'
19'

FIG.6A

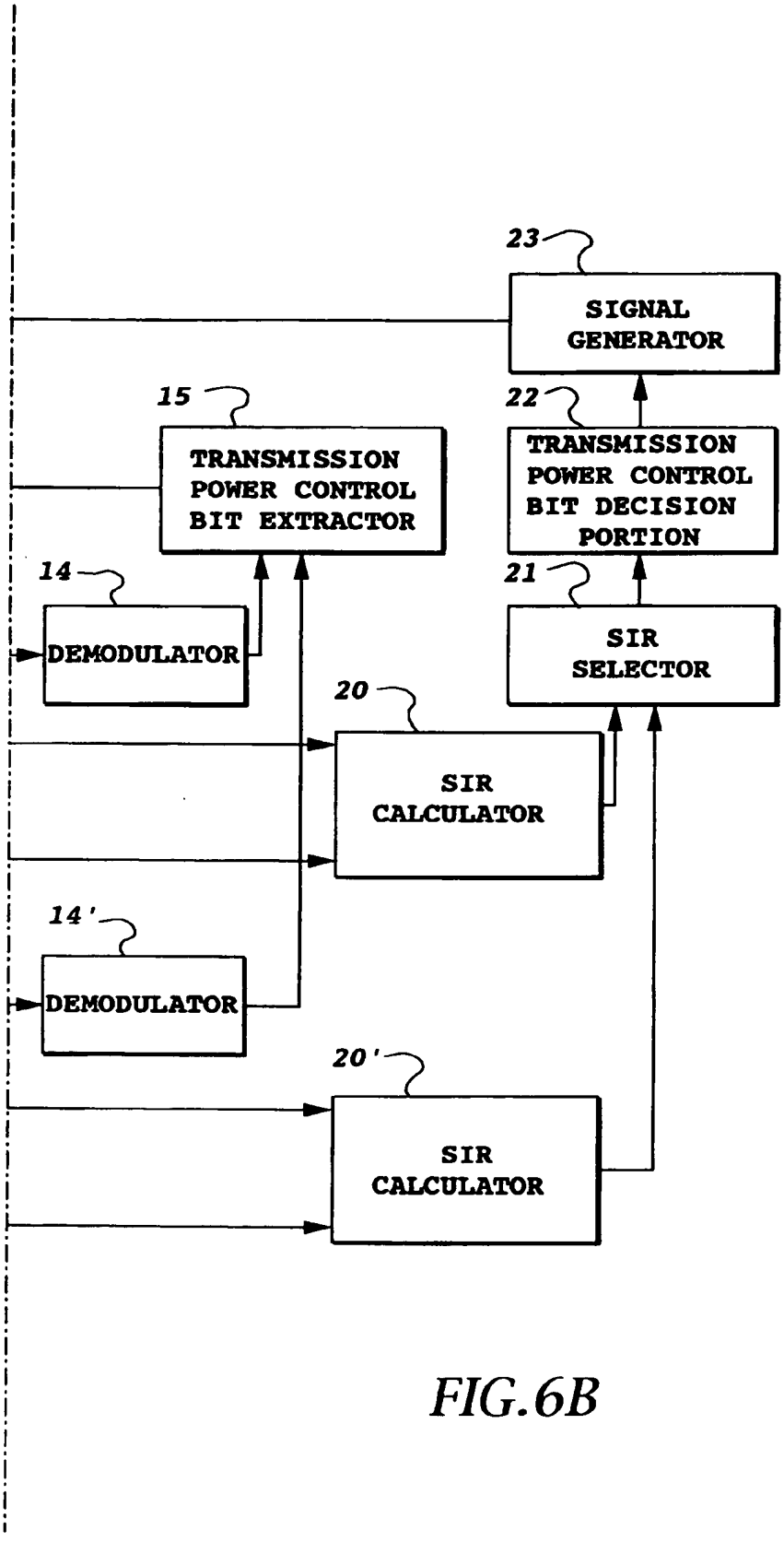
23
SIGNAL GENERATOR
15
TRANSMISSION POWER CONTROL BIT EXTRACTOR
22
TRANSMISSION POWER CONTROL BIT DECISION PORTION
14
DEMODULATOR
21
SIR SELECTOR
20
SIR CALCULATOR
14'
DEMODULATOR
20'
SIR CALCULATOR

FIG.6B